

REMARKS

Claims 2-6, 10-14 and 19-29 have been cancelled, and claims 1, 7 and 9 rewritten to more definitely set forth the invention and obviate the rejection. In addition, new claims 32-37 have been presented. Support for the amendment of Claims 1, 7 and 9 can be found in the Specification on page 3, lines 17-18, and page 4, last line, to page 5, line 14. Support for new claims 32 and 33 can be found in the Specification on page 7, lines 20-25, and page 4, line 11. Support for new claims 34 and 35 can be found in the Specification on page 13, lines 18-22. The present amendment is deemed not to introduce new matter. Claims 1, 7-9 and 32-33 are now in the application.

Reconsideration is respectfully requested of the objection to the abstract.

A substitute abstract has been prepared and provided herewith. It is believed that this new substitute abstract complies with MPEP § 608.01. As such it is believed that the objection is now moot. Withdrawal of the objection is accordingly respectfully requested.

Reconsideration is respectfully requested of the objection to the disclosure.

The objectionable reference to "incorporation" of the priority documents has been deleted from page 1 of the Specification. Therefore, it is believed that the objection is now moot. Withdrawal of the objection is accordingly respectfully requested.

Reconsideration is respectfully requested of the rejection of claims 1-14 and 19-29 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

With regards to the phrase "...as being dispersed therein or immobilized on the surface

thereof...". claim 1 has been amended to now state that the "flame-retardant material" comprises a "polymer material", and the "polymer material" has a "flame retardant" is dispersed in the polymer material or immobilized on the surface of the polymer material. It is believed that this recitation of the various elements, and the disposition of same relative to one another, clarifies any ambiguity.

With regards to the term "natural numbers", claim 1 has been amended to now state that the variable "x" and "y" are "positive integers". Support for this amendment is believed to be inherent, based on the disclosure on page 3 of the Specification that "combustion-inhibitory gas generated by heating from the group expressed as N_xO_y (where, x and y are natural numbers) are responsible for providing the target object an excellent flame retardancy in a cooperative manner". In particular, one of ordinary skill in the art would understand that, to produce combustion-inhibitory gas, a nitric or nitrous oxide component must be present. Therefore, neither x nor y can be 0.

With regards to the phrase "non-metallic nature", this phrase was not meant to describe metallic characteristics, such as shiny appearance, malleability, etc. Rather, this phrase was meant to describe the absence of metals in the compound. As such, claim 1 (which, as amended herein, now encompasses the subject of matter of claim 3) has now been amended to state that the "group expressed as N_xO_y " is "metal-free". Claim 1 has also been amended to state "a metal-free group expressed as N_xO_y (where, x and y are positive integers) comprising a compound selected from the group consisting of **non-metallic** nitric acid compound, **non-metallic** nitrous acid compound and **non-metallic** hyponitrous acid compound".

As described in the Specification on page 4, last line, to page 5, line 16, the present inventors discovered that inclusion of metals in the nitric acid compound, nitrous acid compound or the hyponitrous compound tend to color the "target substance", i.e., the material or substrate comprising or upon which the flame retardant material of the present invention is applied and/or dispersed therein. In particular, it was hypothesized that "[c]oloring is probably ascribable to metal ion" (Specification, page 5, lines 3-4). Thus, in instances where coloring of the target substance is not desired, it is important that the "group expressed as N_xO_y " is "metal-free".

In view of the amendments to claim 1, as well as the cancellation of claim 14, it is believed that the rejection is now moot. Withdrawal of the rejection is accordingly respectfully requested.

Reconsideration is respectfully requested of the rejection of claims 1-3, 7-13 and 19-29 under 35 U.S.C. §103(a) as being unpatentable over Matsumoto, et al. (JP 53-12940).

The cited Matsumoto, et al. reference pertains to a thermoplastic resin composition having flame retardant characteristics. As the Examiner has stated on page 8 of the instant Office Action, Matsumoto, et al. combine a polymer with a magnesium hydroxide powder acting as a flame retardant, the magnesium hydroxide powder being coated with a higher fatty acid or its salts and alkali metal salt of nitrite, nitrate, sulfite, sulfate, or halide. In particular, the thermoplastic resin composition therein comprises 3 elements as follows:

- (a) thermoplastic resin;
- (b) fine magnesium hydroxide powder; and
- (c) one or more selected from the group consisting of nitrite, nitrate, sulfite, sulfate, and

halide of alkali metals (which are coated on the surface of the fine magnesium hydroxide powder).

Specifically, Matsumoto, et al. discovered that "if a magnesium hydroxide with a large effect was selected as an aqueous inorganic compound and alkali metal salts were added in combination, a high flame retardation was achieved by reducing the amount of magnesium hydroxide and a resin with a white color could be provided without being colored" (page 3, last paragraph). Further, Matsumoto, et al. state that if the ratio of magnesium hydroxide to thermoplastic resin is lower than 30-70 wt% magnesium hydroxide to thermoplastic resin, the flame retardation is not sufficient (page 5, line 19, to page 6, line 4).

In addition, it is stated that if the alkali metal is not contained in an amount of at least 0.1 parts by weight, flame retardation is lowered (page 6, line 18, to page 7, line 3). Thus, without both of the metal components, the thermoplastic resin of the Matsumoto, et al. reference will not provide the flame retardant characteristics upon which the invention is based.

In contrast, the flame retardant material of the present invention, as claimed in amended claim 1 herein, calls for:

(a) a polymer material; and

(b) a flame retardant dispersed on the polymer material or immobilized on the surface thereof, the flame-retardant containing:

(i) a **metal-free** group expressed as N_xO_y (where, x and y are positive integers) comprising a compound selected from the group consisting of **non-metallic** nitric acid compound, **non-metallic** nitrous acid compound and **non-metallic** hyponitrous acid compound; and

(ii) a group capable of generating water upon heating.

Patentable unobviousness does not depend upon a showing of advantages or improvements, but upon obviousness. *Ex parte Parthasarathy et al.* 174 USPQ 63 (POBA 1971). However, proof of an unexpected improvement can rebut a prima facie case of obviousness. *In re Murch* 464 F2d 1051, 175 USPQ 89 (CCPA 1972); *In re Costello* 480 F2d 894, 178 USPQ 290 (CCPA 1973).

As described above, and in the Specification on page 4, last line, to page 5, line 16, and pages 31 to 33, Tables 2 and 3, the present inventors unexpectedly discovered that inclusion of metals in the nitric acid compound, nitrous acid compound or the hyponitrous compound tend to color the "target substance", i.e., the material or substrate comprising or upon which the flame retardant material of the present invention is applied. In particular, it was theorized that "[c]oloring is probably ascribable to metal ion" (Specification, page 5, lines 3-4). Thus, in instances where coloring of the target substance is not desired, it is important that the "group expressed as N_xO_y " is "metal-free".

This theory was supported by the test data shown in Tables 2 and 3. For example, when sample 1b, as shown in Table 2, containing zinc nitrate in place of ammonium nitrate was tested, sufficient flame retardancy was found, but "resulted in slight coloring of the resin". Further, sample 2b, as shown in Table 3, produced the same results. In contrast, samples 1 and 5-7, which contain no metal in the group expressed as N_xO_y (referred to as "Nitric acid compound (x)"), were found to have excellent flame retardancy, while causing no coloring of the resin (see Specification, page 34, Table 4 and lines 3-4).

The group capable of generating water upon heating, as claimed herein, is an hydroxyl-containing compound. This compound is comprised of a metal hydroxide, such as magnesium hydroxide, as disclosed in the Matsumoto, et al. However, Matsumoto, et al., fail to teach or suggest a flame retardant having a **metal-free** group expressed as N_xO_y (where, x and y are positive integers) comprising a compound selected from the group consisting of **non-metallic** nitric acid compound, **non-metallic** nitrous acid compound and **non-metallic** hyponitrous acid compound, as claimed herein. Rather, this element comes only from the present invention, and constitutes an important element or aspect thereof.

It was unexpectedly discovered that by including the metal-free group in the flame retardant, as claimed herein, the flame-retardant polymer material of the present invention having the flame-retardant dispersed therein or immobilized on the surface thereof can generate non-combustible gas within a temperature range lower than the temperature range in which such decomposition and elimination occur (see Specification, page 16, lines 6-9). This enables the polymer to exhibit flame-retardant characteristics in air, and in lower temperature ranges, a part of the polymer material is decomposed and emitted as the non-combustible gas. This process of decomposition and emission competes with the combustion process (drastic oxidation) to thereby inhibit combustion and produce the desired flame-retardant effect.


In view of the above, it is respectfully submitted that the disclosure of an alkali metal salt of nitrite, nitrate, sulfite, sulfate, or halide disclosed in Matsumoto, et al. should NOT be equated to the **metal-free** group expressed as N_xO_y . Further, in view of the legal authorities cited above, it is believed that the unexpectedly superior flame-retardant results obtained with the

present invention provide ample evidence of unobviousness. As such, it is believed that the Examiner would now be justified in no longer maintaining the rejection, as there is no prior teaching or suggestion of metal-free group expressed as N_xO_y , as claimed in the present invention. Withdrawal of the rejection is accordingly respectfully requested.

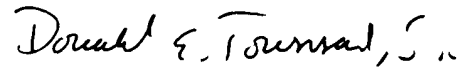
In view of the foregoing, it is respectfully submitted that the application is now in condition for allowance, and early action and allowance thereof is accordingly respectfully requested. In the event there is any reason why the application cannot be allowed at the present time, it is respectfully requested that the Examiner contact the undersigned at the number listed below to resolve any problems.

Respectfully submitted,

TOWNSEND & BANTA

A handwritten signature in cursive script, appearing to read "Donald E. Townsend".

Donald E. Townsend
Reg. No. 22,069

A handwritten signature in cursive script, appearing to read "Donald E. Townsend, Jr.". There is a small mark after the name.

Donald E. Townsend, Jr.
Reg. No. 43,198

TOWNSEND & BANTA
Suite 900, South Building
601 Pennsylvania Ave., N.W.
Washington, D.C. 20004
(202) 220-3124

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